

CLAIMS

What is claimed is:

1. A hydraulic drive device capable of driving in a forward and a reverse direction comprising:

a casing;

a hydraulic pump located within the casing;

a control arm coupled to the hydraulic pump to control the hydraulic pump fluid flow;

a first switch cooperating with the control arm and having an open state and a closed state, wherein the state of the switch is indicative of the control arm assuming a first position; and

a second switch cooperating with the control arm and having an open state and a closed state, wherein the state of the switch is indicative of the control arm assuming a second position.

2. The hydraulic drive device of claim 1, wherein the first position of the control arm corresponds to the hydraulic drive device driving in the forward direction.

3. The hydraulic drive device of claim 2, wherein the first switch being in the open state is indicative of the control arm being in the first position.

4. The hydraulic drive device of claim 1, wherein the second position of the control arm corresponds to the hydraulic drive device driving in the reverse direction.

5. The hydraulic drive device of claim 4, wherein the second switch being in the open state is indicative of the control arm being in the second position.
6. The hydraulic drive device of claim 1, wherein the first switch is attached to the control arm.
7. The hydraulic drive device of claim 6, wherein a feature formed on the casing cooperates with the first switch to change the first switch between the open and closed states.
8. The hydraulic drive device of claim 1, wherein the second switch is attached to the control arm.
9. The hydraulic drive device of claim 8, wherein a feature formed on the casing cooperates with the second switch to change the second switch between the open and closed states.
10. The hydraulic drive device of claim 1, further comprising a return-to-neutral mechanism coupled to the control arm, the return-to-neutral mechanism also including a stationary arm.
11. The hydraulic drive device of claim 10, wherein the first switch is attached to the stationary arm.
12. The hydraulic drive device of claim 10, wherein the second switch is attached to the stationary arm.
13. The hydraulic drive device of claim 10, wherein a feature formed on the stationary arm cooperates with the first switch to change the first switch between the open and closed states.

14. The hydraulic drive device of claim 10, wherein a feature formed on the stationary arm cooperates with the second switch to change the second switch between the open and closed states.
15. The hydraulic drive device of claim 10, wherein the position of the stationary arm establishes the neutral position of the hydraulic drive device.
16. The hydraulic drive device of claim 1, wherein the first switch is mechanically actuated.
17. The hydraulic drive device of claim 1, wherein the second switch is mechanically actuated.
18. The hydraulic drive device of claim 1, wherein the first switch is a proximity switch.
19. The hydraulic drive device of claim 1, wherein the second switch is a proximity switch.
20. The hydraulic drive device of claim 1, wherein a prime mover is drivingly coupled to the hydraulic drive device.
21. The hydraulic drive device of claim 20, wherein an ignition is electrically coupled to the prime mover and the first switch and the second switch.
22. The hydraulic drive device of claim 21, wherein the control arm being in a neutral position places the first switch and the second switch in the closed state and enables the ignition.
23. The hydraulic drive device of claim 21, wherein the control arm being in the first position places the first switch in the open state and disables the ignition.

24. The hydraulic drive device of claim 21, wherein the control arm being in the second position places the second switch in the open state and disables the ignition.
25. The hydraulic drive device of claim 20, wherein the hydraulic drive device further includes a mower blade.
26. The hydraulic drive device of claim 25, wherein the mower blade is electrically coupled to the second switch.
27. The hydraulic drive device of claim 26, wherein the control arm being in the second position places the second switch in the open state and disables the mower blade.
28. The hydraulic drive device of claim 1, wherein the positions of the first switch and the second switch with respect to the control arm are jointly adjustable.
29. The hydraulic drive device of claim 1, wherein the positions of the first switch and the second switch with respect to the control arm are independently adjustable.
30. A hydraulic drive device capable of driving in a forward and a reverse direction comprising:
 - a variable displacement hydraulic pump;
 - a control arm coupled to the hydraulic pump for controlling pump displacement;
 - a first switch cooperating with the control arm, the first switch providing a first signal when the control arm assumes a first position; and
 - a second switch cooperating with the control arm, the second switch providing a second signal when the control arm assumes a second position.

31. The hydraulic drive device of claim 30, wherein the first position corresponds to the hydraulic drive device driving in a forward direction.
32. The hydraulic drive device of claim 30, wherein the second position corresponds to the hydraulic drive device driving in a reverse direction.
33. The hydraulic drive device of claim 30, wherein in a prime mover is drivingly coupled to the hydraulic drive device.
34. The hydraulic drive device of claim 33, wherein the hydrostatic device further includes an ignition electrically coupled to the prime mover and the first switch and the second switch.
35. The hydraulic drive device of claim 34, wherein the control arm being in the neutral position places the first switch and second switch in a closed state and enables the ignition switch to actuate the prime mover.
36. The hydraulic drive device of claim 32, wherein a mower blade is coupled to the hydraulic drive device.
37. The hydraulic drive device of claim 36, wherein the control arm being in the second position causes the second switch to provide the second signal to the mower blade, thereby causing the mower blade to be disabled.
38. The hydraulic drive device of claim 30, wherein the positions of the first switch and the second switch with respect to the control arm are jointly adjustable.
39. The hydraulic drive device of claim 30, wherein the positions of the first switch and the second switch with respect to the control arm are independently adjustable.

40. A hydraulic drive device attached to a vehicle having a prime mover, which is drivingly coupled to the hydraulic drive device, the hydraulic drive device comprising:

a housing;

a hydraulic pump positioned within the housing;

a control arm coupled to the hydraulic pump for controlling the hydraulic pump output;

an ignition switch electrically coupled to the prime mover; and

a pair of neutral switches cooperating with the control arm and electrically connected to the ignition switch, each of the neutral switches having an open position where the ignition switch is disabled and a closed position where the ignition switch is enabled, wherein both of the neutral switches will assume the closed position when the control arm is in a predefined position.

41. The hydraulic drive device of claim 40, wherein the predefined position is a neutral position.

42. A hydrostatic transaxle drivingly coupled to a prime mover, where the prime mover is electronically coupled to an ignition switch, the hydrostatic transaxle including a casing, a hydraulic pump mounted within the casing and in fluid communication with a hydraulic motor, a moveable swash plate cooperable with the hydraulic pump for controlling the speed and direction of rotation of the hydraulic motor, and a control arm coupled to the moveable swash plate for adjusting the orientation of the swash plate, wherein the improvement comprises:

a return-to-neutral mechanism drivingly coupled to the control arm for returning the control arm to a neutral position, the return-to-neutral mechanism further comprising a stationary arm, an inner scissor return arm, an outer second scissor return arm, and a biasing device for rotating the control arm to a neutral position; and

a pair of neutral switches cooperating with the control arm and electrically connected to the ignition switch, each of the neutral switches having an open position where the ignition switch is disabled and a closed position where the neutral switch is enabled, wherein both of the neutral switches assume the closed position when the control arm is in a predefined position.

43. The hydraulic drive device of claim 42, wherein the predefined position is a neutral position.

44. A hydraulic drive device drivingly coupled to a mower blade comprising:
a variable displacement hydraulic pump;
a control arm coupled to the hydraulic pump for controlling pump displacement;
and

a switch cooperating with the control arm, the switch providing a signal when the control arm assumes a predefined position, wherein the control arm being in the predefined position places the switch in an open state and disables the mower blade.

45. The hydraulic drive device of claim 44, wherein the predefined position is a forward position.

46. The hydraulic drive device of claim 44, wherein the predefined position is a reverse position.